

U.S. Patent Application Serial No. 10/507,066
Reply to Office Action of October 26, 2006

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims:

1. (Currently Amended) A resonator apparatus, ~~of the type used for use~~ in filters for an electrical signal, comprising:
 - a. a first resonator device, having a first end and a second end;
 - b. a second resonator device; and
 - c. wherein the first end and the second end are arranged and configured to lie on the same side of the first resonator and proximate the second resonator, and wherein a first distance of the first end from the second resonator creates a primary coupling between the first and second resonators, and a second distance and a length of the second end creates a secondary coupling between the first and second resonators, ~~whereby wherein the first distance and the second distance do not equal one another and~~ the overall distance of the first and second resonators from one another ~~may be~~ is optimized by independently controlling the primary or secondary coupling.
2. (Original) The resonator apparatus of claim 1, wherein the first and second resonator devices are constructed in an HTS microstrip configuration.
3. (Currently Amended) ~~The A resonator apparatus of claim 1, for use in filters for an electrical signal, comprising:~~
 - a. ~~a first resonator device, having a first end and a second end;~~
 - b. ~~a second resonator device; and~~
 - c. ~~wherein the first end and the second end are arranged and configured to lie on the same side of the first resonator and proximate the second resonator, and wherein a first distance of the first end from the second resonator creates a primary coupling between the first and second resonators, and a second distance and a length of the second end creates a secondary coupling between the first and second resonators, whereby the overall distance of the first and second resonators from one another is optimized by independently controlling the primary or secondary coupling,~~ wherein the first end is arranged and configured to provide a substantially larger interface to the second resonator than the second end.

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4. (Currently Amended) The A resonator apparatus of claim 1, for use in filters for an electrical signal, further comprising:
 - a. a first resonator device, having a first end and a second end;
 - b. a second resonator device;
 - c. a coupling strip which couples the second end to the second resonator; and
 - d. wherein the first end and the second end are arranged and configured to lie on the same side of the first resonator and proximate the second resonator, and wherein a first distance of the first end from the second resonator creates a primary coupling between the first and second resonators, and a second distance and a length of the second end creates a secondary coupling between the first and second resonators, whereby the overall distance of the first and second resonators from one another is optimized by independently controlling the primary or secondary coupling.
5. (Original) The resonator apparatus of claim 4, wherein the primary coupling F_1 is a function of the distance S_1 between the first and second resonators , and the secondary coupling F_2 is a function of S_{2a} , S_{2b} , L_{2a} and L_{2b} where S_{2a} is the distance between the coupling strip and the first resonator and L_{2a} is the length of the coupling strip which lies adjacent the first resonator, S_{2b} is the distance between the coupling strip and the second resonator and L_{2b} is the length of the coupling strip which lies adjacent the second resonator, wherein the total coupling between the first resonator and the second resonator, F , is defined by:
$$F = F_1(S_1) + F_2(S_{2a}, S_{2b}, L_{2a}, L_{2b}).$$
6. (Original) The resonator apparatus of claim 1, wherein the primary coupling can be either capacitive or inductive and the secondary coupling can be either capacitive or inductive.
7. (Original) The resonator apparatus of claim 1, wherein the primary coupling can be either capacitive or inductive.
8. (Original) The resonator apparatus of claim 1, wherein the secondary coupling can be either capacitive or inductive.

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9. (Original) The resonator apparatus of claim 1, further comprising at least one non-adjacent resonator device and a coupling strip between the first resonator and the at least one non-adjacent resonator device.

10. (Currently Amended) The resonator apparatus of claim 2, wherein the micro-strip topology includes a dielectric substrate of either MgO, LaAlO₃, Al₂O₃, or YSZ.

11. (Currently Amended) A filter for electrical signals, comprising:

a. a plurality of resonators, at least one resonator having a first end and a second end; and

b. the first end and the second end being arranged and configured to lie on the same side of the at least one first resonator and proximate a second resonator, and wherein a first distance of the first end from the second resonator creates a primary coupling between the at least one first resonator and the second resonator resonator, and a second distance and a length of the second end creates a secondary coupling between the at least one first resonator and the second resonators resonator, whereby wherein the first distance and the second distance do not equal one another and the overall distance of the at least first resonator and the second resonator resonators from one another may be is optimized by independently controlling the primary or secondary coupling.

12. (Original) A filter for electrical signals, comprising:

a. a first resonator device;

b. a second resonator device;

c. a coupling strip between the first and second resonators; and

d. the first resonator device and the second resonator device having a primary coupling and a secondary coupling between the first and second resonators, wherein the overall distance of the first and second resonators from one another establishes the primary coupling and the distance between the coupling strip and the overlap with the first and second resonators establishes the secondary coupling, whereby the distances between adjacent resonators may be optimized by controlling either the primary or secondary coupling.

13. (Currently Amended) A method of controlling coupling in an electric signal filter, having a first and second resonator and a coupling strip, comprising the steps of:

a. determining the a primary coupling between the first and second resonators based on the desired distance between the first and second resonators;

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b. determining the a desired secondary coupling in order to arrive at the total desired coupling between the first and second resonators; and

c. determining the distances and lengths of the coupling strip from the first and second resonators to achieve the determined secondary coupling $F2$, where $F2$ is a function of $S2a$, $S2b$, $L2a$ and $L2b$, and $S2a$ is defined as the distance between the coupling strip and the first resonator, $L2a$ is the length of the coupling strip which lies adjacent the first resonator, $S2b$ is the distance between the coupling strip and the second resonator, and $L2b$ is the length of the coupling strip which lies adjacent the second resonator, the primary coupling $F1$, wherein the total coupling between the first resonator and the second resonator, F , is defined by:

$$F = F1(S1) + F2(S2a, S2b, L2a, L2b).$$

14. (Original) The method of claim 13, further comprising the step of locating at least one non-adjacent resonator device and a coupling strip between the first resonator and the at least one non-adjacent resonator device.

15. (Currently Amended) The resonator apparatus of claim 1, wherein the first and second resonator devices generally define a mean plane and further comprising a coupling strip which couples the second end to the second resonator, the coupling strip being located in the mean plane.

16. (New) The resonator apparatus of claim 4, wherein the primary coupling can be either capacitive or inductive and the secondary coupling can be either capacitive or inductive.

17. (New) The resonator apparatus of claim 4, wherein the primary coupling can be either capacitive or inductive.

18. (New) The resonator apparatus of claim 4, wherein the secondary coupling can be either capacitive or inductive.

19. (New) The resonator apparatus of claim 4, further comprising at least one non-adjacent resonator device and a coupling strip between the first resonator and the at least one non-adjacent resonator device.

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20. (New) The resonator apparatus of claim 4, wherein the first and second resonator and the coupling strip are all located on a common planar surface of a circuit substrate.